

S/N 09/694,927



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PATENT

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: HUANG ET AL. Examiner: TRAN LIEN, THUY
Serial No.: 09/694,927 Group Art Unit: 1761
Filed: OCTOBER 24, 2000 Docket No.: 8863.73US01
Title: FOOD PRODUCT WITH ENHANCED CRISPINESS

DECLARATION BY FERN PANDA

Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

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1. I, Fern Alane Panda, obtained a B.S. degree in biology from Purdue University and a M.S. degree from the University of Minnesota in food science. I have been employed by Pillsbury / General Mills for seven years. My work is in the area of product development.
2. I am one of the inventors of U.S. Patent Application Serial No. 09/694,927 entitled "Food Product with Enhanced Crispiness" (hereinafter "the patent application" or "the claimed invention"). I am also familiar with U.S. Patent No. 4,812,323 issued to Savage on 14 March 1989 entitled "Method for Preparing a Cup-Shaped Cookie" (hereinafter "Savage").
3. Savage discloses a cookie having a cupped shape. The following formulation is disclosed for preparing the cookie:

Partially hydrogenated animal and/or vegetable shortening	16.2%
Brown sugar	18.7%
Corn syrup solids	12.0%
Eggs	9.4%
Vanilla	0.25%
Salt	0.37%
Sodium bicarbonate	0.25%

Wheat flour	42.0%
Modified food starch	0.37%

4. If the DE value of the corn syrup solids is not specified, it is customary in the baking art to conclude that the corn syrup solids are in the range of about 36 to 43 DE. Thus, the corn syrup solids included in the Savage formulation are, most likely, corn syrup solids having a DE value of about 36 to 43. See Lorenz, Klaus J., "Carbohydrates in Cookies," in Cookie Chemistry and Technology, ed. Karel Kulp, American Institute of Baking, Manhattan, Kansas (1994); and Schanot, M. A., "Sweeteners: Functionality in Cookies and Crackers," Tech. Bull. Am. Inst. Baking 3(4): pp. 1-4 (1981).

5. The patent application provides a dough or batter composition, a baked good made from the dough or batter composition, or a filled food product made from the dough or batter composition. The dough or batter composition includes flour, water, and a sweetener. The sweetener includes at least one high molecular weight starch hydrolysate having a DE of 1 to 20 or a crystalline hydrate former. The composition, when baked to a thickness of about 2.2 mm, has a modulus of at least 200 g/mm² at moisture content of 10 wt.%.

6. The formulation disclosed by Savage is a typical cookie formulation that contains high fat and low moisture. Most of the moisture in the formulation is from the eggs. Consequently, the sugar and the corn syrup solids are not totally dissolved or hydrated in the formulation. In contrast, the batter compositions in the Example section of the patent application contained over 40 weight percent water and less than 2 weight percent fat. The sweetener was dissolved in the water.

7. The structure of baked goods produced according to the claimed invention is different than the structure of the cookie produced according to the Savage formulation. The starch in the flour in the claimed invention can undergo gelatinization due to the high moisture content of the batter or dough composition. In contrast, because of the low moisture content, the starch in the flour of the Savage batter composition does not undergo gelatinization. See Kulp et al., "Starch functionality in cookie systems," Starch, 43(2), pp. 53-57 (1991); and Livings et al., "Ageing in

confectionary wafers," in The Glassy State of Foods, ed. J. Blanshard and P. Lillford, Nottingham University Press, Loughborough, Leicestershire (1993).

8. According to the claimed invention, the amount of starch hydrolysate or crystalline hydrate former can be used to control the crispiness of the baked good. Crispiness is determined by measuring the modulus of the baked good. Crispy products tend to have a higher modulus.

9. The crispiness of several formulations containing sweeteners with different DE values were compared. The basic formulation is shown in Table 1.

Table 1: Basic Formulation for Batter and Baked Goods

<u>Ingredient</u>	<u>Wt.% in Batter</u>	<u>Wt.% in Baked Product</u>
Flour (dry basis)	37.2	61.8
Water	41.0	2.0
Sweetener	19.8	32.9
Shortening	1.4	2.3
Lecithin	0.3	0.5
Salt	0.3	0.5

10. In a first set of experiments, the sweeteners contained 20 DE corn syrup solids, brown sugar, or a mixture thereof. The DE values were calculated by dividing 100 by the average degree of polymerization of each sweetener. The samples were labeled A to F as shown in

Table 2.

Table 2: Sweeteners for Formulations A to F

<u>Formulation</u>	<u>Sweetener</u>	<u>DE value</u>
A	100 wt.% brown sugar	53
B	80 wt.% brown sugar and 20 wt.% 20 DE corn syrup solids	39
C	60 wt.% brown sugar and 40 wt.% 20 DE corn syrup solids	31
D	40 wt.% brown sugar and 60 wt.% 20 DE corn syrup solids	26
E	20 wt.% brown sugar and 80 wt.% 20 DE corn syrup solids	22
F	100 wt.% 20 DE corn syrup solids	20

The details for preparing the baked goods (wafers) are similar to those described in Example 1 of the patent application (see pages 12 to 14 of the specification).

11. Wafers were place as a single layer in a 70% relative humidity chamber at 72 °F (about 22 °C). The wafers were left in the humidity chamber for up to 24 hours. Upon removal from the humidity chamber, the wafers were heat sealed in a 2.5 mil thick metallized polyester pouch and allowed to equilibrate for at least 5 days. The moisture content was calculated using the initial moisture content and the amount of weight gained after exposure to the 70% relative humidity chamber. This is an accelerated test and is used only for the purpose of comparing samples.

12. A plot of the moisture content versus time in the 70% relative humidity chamber at 72 °F is shown in **Figure 1** for formulations A to F. The wafers containing a sweetener having a higher DE value picked up more moisture than the wafers containing a sweetener having a lower DE value. Thus, the wafers containing a sweetener having a higher DE value are more likely to seem soggy over time than those containing a sweetener having a the lower DE value.

13. The modulus of each wafer formulation was determined using the method described on page 14 of the patent application. **Figure 2** is a plot of modulus versus moisture content for formulations A to F. The modulus of all the samples decreased at higher moisture contents. For example, all samples had a relatively low modulus when the moisture content exceeded about 12 wt.%. The higher the DE value of the sweetener, however, the higher the moisture content could

be before the modulus decreased substantially. For example, at 10 wt.% moisture, the modulus of wafers containing a sweetener having a DE value of 20 or 22 were higher than the modulus of wafers containing a sweetener having a DE value of 26 to 53. Thus, wafers containing a sweetener with a lower DE value are more likely to remain crispy over time.

14. Further experiments were conducted using the basic formulation shown in Table 1 and various sweeteners compositions shown in **Table 3** to prepare formulations G to J.

Table 3: Sweeteners for Formulations M to P

<u>Formulation</u>	<u>Sweetener</u>
G	100 wt.% sucrose
H	100 wt.% 10 DE maltodextrin
I	100 wt.% 20 DE corn syrup solids
J	50 wt.% sucrose and 50 wt.% 20 DE corn syrup solids

15. **Figure 3** is a plot of the modulus versus moisture content after exposure of wafers to a 70% relative humidity chamber. Formulations H, I, and J (those having at least 50 wt.% of a starch hydrolysate having a DE value of 10 or 20) had a modulus greater than 200 g/mm² with moisture content of 10 wt.%.

16. Formulations containing a starch hydrolysate having a DE value of 1 to 20 tend to pick up less moisture as a function of time compared to formulations not containing such a starch hydrolysate. Thus, formulations containing a starch hydrolysate having a DE value of 1 to 20 are advantageous because the baked goods prepared from these formulations can remain crispy for longer periods of time when stored in an atmosphere where moisture can be picked up by the baked goods.

17. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued therefrom.

Dated: June 3, 2002

By: Fern Alane Panda
Fern Alane Panda